

FALMOUTH HARBOR MASSACHUSETTS

SURVEY REPORT



**WAR DEPARTMENT, CORPS OF ENGINEERS, U. S. ARMY
U. S. ENGINEER OFFICE, PROVIDENCE, RHODE ISLAND**

26 JULY 1946

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NOT FOR PUBLIC RELEASE

WAR DEPARTMENT
UNITED STATES ENGINEER OFFICE
PROVIDENCE, RHODE ISLAND

26 July 1946

Subject: Survey of Falmouth Harbor, Massachusetts.

To: The Division Engineer, New England Division, Boston, Mass.

SYLLABUS

The District Engineer finds that existing and prospective pleasure-craft use of Falmouth Harbor, Massachusetts warrants improvement of the locality. He recommends that a project be authorized to provide for an entrance channel 10 feet deep at mean low water and 100 feet wide into the Inner Harbor, and for an anchorage area of the same depth and about 17 acres in extent in the Inner Harbor; all at an estimated cost of \$70,000 for new work, with \$4,000 annually for maintenance, subject to certain conditions of local cooperation.

AUTHORITY

1. This survey report on Falmouth Harbor, Massachusetts is authorized by the item in Section 6 of the River and Harbor Act approved March 2, 1945 which reads as follows:

"Falmouth Harbor, Massachusetts."

A survey to determine the advisability and cost of improvement and the local cooperation required was directed following review of the preliminary examination report by the Board of Engineers for Rivers and Harbors.

DESCRIPTION

2. Falmouth Harbor is located on the south shore of Cape Cod near its western end. It lies between the headlands of Nobska Point and Falmouth Heights, just east of Woods Hole, the easternmost of several passages connecting Buzzards Bay and Vineyard Sound. The harbor is an open roadstead about 3 miles in length, the maximum width of the indentation from a line connecting the headlands being about 3/4 mile. The depths increase gradually from the shore to a maximum of about 35 feet on the line connecting the headlands, from which there are depths up to

60 feet out to a series of shoals with depths as little as 10 feet due east of Nobska Point. The harbor is exposed to winds from the southwest, through the south to the northeast. Great Harbor at Woods Hole, less than one mile west of Nobska Point, affords much better shelter. The mean tidal range is 1.3 feet at Falmouth Heights and 1.5 feet at Nobska Point.

3. Falmouth Inner Harbor is a small tidal lagoon with its entrance just west of the Falmouth Heights headland. It has a length of about 0.7 mile and a maximum width of about 0.1 mile. The Commonwealth of Massachusetts has dredged to a depth of 10 feet at mean low water in the entrance channel and has protected the channel by two short stone jetties. The maximum depth inside the harbor is about 11 feet. No Federal project has been adopted for the improvement of Falmouth Harbor or Falmouth Inner Harbor. No bridges cross any portion of the waterways under consideration.

4. The locality is shown on U. S. Coast and Geodetic Survey Charts 249, 1209 and 1210, and on Plate 1 (File No. Ph.4) accompanying this report.

TRIBUTARY AREA

5. The area tributary to Falmouth Harbor is a portion of the Town of Falmouth. The population of the town in 1940 consisted of 6,677 year-round residents. This is increased by a summer population of from 21,000 to 35,000. Between 1930 and 1935 the permanent population increased about 35 percent. A smaller increase occurred between 1935 and 1940. The real property valuation of the town is about \$23,000,000 of which 57 percent is owned by non-residents. In 1939 there were 1,578 non-resident taxpayers. Statistics compiled by Millard C. Faught and contained in the book "Falmouth, Massachusetts" published by the Columbia University Press in 1945 indicate that the residence distribution of 1,000 non-resident taxpayers responding to a questionnaire was as follows:

Metropolitan Boston	- 294
Connecticut, Massachusetts and Rhode Island, exclusive of Boston	- 413
Maine, New Hampshire, and Vermont	- 14
Metropolitan New York	- 136
New York State	- 23
Middle Atlantic States	- 77
Midwest	- 27
South	- 12
Far West	- <u>4</u>
Total	1000

6. Falmouth has the largest per capita property valuation on Cape Cod and the seventh largest per capita valuation in the state. Retail trade totals over \$4,700,000 annually, of which 60 percent is derived from the summer resort business. The three boatyards report that expenditures by pleasure-boat owners total about \$300,000 annually. Fishing craft expend an additional \$100,000 annually. The main business interests are located at the Town Center about one mile northwest of the entrance to Falmouth Inner Harbor, and at Woods Hole, about 4 miles to the west.

7. The area is primarily a summer resort. Major industries include service to the summer population, boat repairing and fishing. There is some truck farming, but no manufacturing. Banking facilities are available in the village of Falmouth. The territory is served by the Woods Hole branch of the New York, New Haven and Hartford Railroad. Woods Hole is a stop on the steamship line connecting New Bedford and the Islands of Martha's Vineyard and Nantucket.

PRIOR REPORTS

8. Falmouth Harbor was the subject of an unfavorable preliminary examination in 1886, which considered the advisability of providing a harbor of refuge at Falmouth. It is printed in House Document No. 58, 50th Congress, 1st Session and on page 567 of the Annual Report of the Chief of Engineers for 1887. In 1903, a Board of Engineers, in report-

ing on the relative merits of various locations in Vineyard and Nantucket Sounds for harbors of refuge, submitted the opinion that one should be formed at Falmouth Harbor by constructing a breakwater eastward from Nobska Point at an estimated cost of \$1,132,500. This report is printed in House Document No. 60, 58th Congress, 2d Session, and on page 966 of the Annual Report of the Chief of Engineers for 1904. No action on this recommendation was taken by Congress.

LOCAL COOPERATION AND OTHER IMPROVEMENTS

9. As no Federal improvement of the harbor has been authorized, no requirement of local cooperation has been prescribed by law. The Commonwealth of Massachusetts, in cooperation with local interests, has improved and maintained Falmouth Inner Harbor by jetties and dredging at a cost to date of about \$178,000. Under the State project there has been dredged an entrance channel 10 feet deep, and a basin in the lower inner harbor 9 feet deep. The upper 1600 feet of the inner harbor was dredged to 6 feet by the State in 1927. Maintenance dredging by the State in 1946 restored the entrance channel to a depth of 10 feet at mean low water. Minor shoaling has occurred in the lower inner harbor.

TERMINAL AND TRANSFER FACILITIES

10. The Town of Falmouth maintains two small public wharves in Falmouth Inner Harbor. Both are located near the entrance, at Clinton Avenue, one on the east, and the other on the west side of the harbor. Each wharf has berthage of about 50 feet. They are used as terminals for the shipment of freight to Martha's Vineyard and Nantucket Islands, and as landings for visiting craft. Some fish is landed at these piers. No handling or transfer facilities are available. There are no other public piers, although the three boat yards permit use of their docks free of charge, subject to the owner's convenience. Several other small piers are situated in the harbor, but are used exclusively by their owners as landing places for pleasure craft. Additional public wharfage is needed for the use of pleasure craft. Ample room is avail-

able for its construction and for the construction of other facilities when required.

IMPROVEMENT DESIRED

11. A public hearing, held at Falmouth, Massachusetts on May 22, 1945, was attended by about 20 people including representatives of the State, Town and local business. The Board of Selectmen presented a plan of improvement consisting of the dredging of a 100-foot entrance channel and the entire inner harbor to a depth of 10 feet below mean low water, and the repair and extension of the State jetties. Local interests proposed to bulkhead the entire inner harbor and desire a depth of 10 feet up to these bulkheads. This plan was concurred in by all interested parties. There was no opposition to the improvement.

12. In justification of the proposed improvements local interests stated that an increase in the size of the harbor is necessary to accommodate the ever increasing number of local and visiting craft. The belief was expressed that the improvements would double the amount of business in the local boat yards with a consequent large increase in the Town's retail business. They cited the proximity of the harbor to the business center of Falmouth. It was stated that Falmouth possesses the only boat yards east of New Bedford capable of repairing the modern fishing boats, and that lack of adequate channels to these yards has caused a large loss of time and money to fishermen as their vessels must make the run to New Bedford for repairs. A prospective increase in annual business, totalling at least \$500,000, was forecast by the sponsors of the project. In addition, local interests stressed the value of the harbor for refuge.

13. The Board of Selectmen offered financial cooperation toward fulfillment of the work. About \$11,000 is already available, and the possibility of an additional appropriation exists. A spokesman for the Commonwealth of Massachusetts indicated that the State could be expected to contribute a portion of the cost. In addition, spoil-disposal areas were offered by several private individuals.

COMMERCE

14. The commerce of Falmouth Harbor has consisted mainly of shipments of gasoline, ice, and miscellaneous building materials to the islands of Marthas Vineyard and Nantucket. Fish is received from Nantucket Island and from the local fleet. No complete statistics are available concerning the receipt of fish. Details of commodities except fish handled for the past four years are given in the following tabulation.

<u>Commodities - Receipts and Shipments</u>					
<u>In Short Tons</u>					
<u>Year</u>	<u>Gasoline</u>	<u>Building Materials</u>	<u>Machinery & Autos</u>	<u>General Mdse.</u>	<u>Total</u>
1942	30	61	6	183	280
1943	46	1515	-	154	1715
1944	185	223	4	1313	1725
1945	318	122	54	250	744

15. The tonnages shown in the foregoing table are not entirely indicative of the normal peacetime commerce of the harbor. Normal annual commerce varies between 1000 and 2000 tons, exclusive of fish landed at the Town wharves for which no records are available. While this commerce is small compared with the commerce of Woods Hole Harbor, it is a substantial tonnage for a small harbor with minor facilities. It may be explained by the proximity of Falmouth Harbor to Vineyard Haven and Nantucket Harbors, and to the ease of navigation between them. It is conjectural whether or not the proposed improvements would increase this commerce, or whether there would be any savings in transportation costs.

16. Local interests believe that the proposed improvements would increase the already considerable pleasure-boat activities in the harbor. Three boat-servicing establishments, with an annual business stated to total about \$400,000, are located in the harbor. These boat yards service local pleasure and fishing craft as well as a large number of transient craft. It is expected by the sponsors of the improvement that this business would be doubled and that retail sales would increase by about \$100,000.

VESSEL TRAFFIC

17. The trips and drafts of vessels carrying the commerce of the harbor for the years 1942 to 1945 are furnished in the following tabulation:

Trips and Drafts of Commercial Vessels

Loaded Draft (feet)	<u>Inbound or Outbound Motor Vessels</u>			
	<u>1942</u>	<u>1943</u>	<u>1944</u>	<u>1945</u>
6-8	7	45	70	75

18. In addition to the foregoing commercial traffic, the harbor is used by a large number of fishing and pleasure craft. The local pleasure-craft fleet which permanently moors in Falmouth Inner Harbor is said to number about 65 vessels, most of which are between 20 and 70 feet in length and draw up to 8 feet of water. The total value of this fleet is reported to be about \$150,000. During the summer season many transient boats use the harbor. It is reported that about 160 vessels are stored in the boat yards during the winter. No record is available of the number of trips made by either pleasure or fishing craft.

DIFFICULTIES ATTENDING NAVIGATION

19. Several groundings have been reported in the entrance channel, but a depth of 10 feet at mean low water has been restored by the Commonwealth of Massachusetts in 1946. During the summer season the entire inner harbor is crowded with local and visiting craft. Mooring in the fairway, which is necessitated by inadequate anchorage facilities, hinders navigation to and from the service yards. Other than the foregoing there are no unusual hazards to navigation.

SURVEY

20. For the purpose of this report, a hydrographic and topographic survey has been made of the inner harbor and entrance channel. No probings were considered necessary as all information available indicates that no rock or boulder areas will be encountered above a plane 11 feet below mean low water. The latest available information is shown on the

accompanying map, Plate 1 (File No. Ph. 4)

PLANS OF IMPROVEMENT

21. An estimate has been prepared for the desired improvement, except that no jetty work is included. It is not apparent that such work at this time would decrease maintenance dredging sufficiently to justify the expenditures desired by local interests. The desired plan consists of an entrance channel 10 feet deep at mean low water and 100 feet wide, the bulkheading of the entire inner harbor and the dredging of the area so inclosed to a depth of 10 feet at mean low water. An alternate plan has been considered also. It consists of an entrance channel 10 feet deep at mean low water and 100 feet wide, and the dredging of about 17 acres in the Inner Harbor to the same depth. The alternate plan assumes that local interests will construct at their own expense about 900 linear feet of bulkhead. Dredging estimates are based on hydraulic removal and disposal on the beach east of the entrance and on other spoil areas to be provided by local interests. The estimates include 1 foot allowable overdepth dredging. The unit prices for dredging include costs of engineering and administration. They are based on current price levels.

Estimated cost of desired improvement

Entrance channel and anchorage area
in Inner Harbor, about 30 acres, all
10 feet deep at M.L.W.

Dredging 300,000 cubic yards of sand
at 55 cents

\$165,000

Estimated annual cost of maintenance
(including that of existing jetties)

5,000

Estimated cost of alternate improvement

Entrance channel and anchorage area in
Inner Harbor, about 17 acres, all 10
feet deep at M.L.W.

Dredging 100,000 cubic yards of sand
at 70 cents

70,000

Estimated annual cost of maintenance
(including that of existing jetties)

4,000

tures required and annual charges are summarized in the following tabulation:

22. Additional expenditures will be made by the Town of Falmouth in improvement of the harbor. Under the alternate plan, the town proposes to construct about 900 linear feet of bulkhead. This bulkhead will be arranged for tying-up pleasure craft. It will be situated adjacent to the town park on the east side of the harbor. The estimated cost of this work is \$45,000, which amount can be liquidated through wharfage and other charges. For the desired plan bulkheads are estimated to cost about \$300,000 of which probably not more than \$50,000 could be liquidated through wharfage charges until such time as the harbor is used to a greater extent than now anticipated. If a Federal project is authorized the existing jetties should be placed in good condition by local interests prior to acceptance. The cost of this work would be nominal. Future maintenance would be part of the project.

AIDS TO NAVIGATION

23. The Coast Guard has been consulted and has concurred in the opinion that the plans under consideration will require no additional navigation aids. The west jetty beacon, destroyed in 1944, will be replaced by a lighted buoy regardless of Federal improvement of the Inner Harbor.

ANALYSIS OF ECONOMIC JUSTIFICATION

24. The total annual charges have been computed for the desired and alternate plans of improvement. Interest and amortization were figured using an interest rate of 3 percent on Federal investment and 3-1/2 percent on non-Federal funds. A useful life of 25 years has been assumed for all improvements. A local contribution totalling about 50 percent of the total cost of the improvements has been assumed. Expenditures required and annual charges are summarized in the following tabulation:

Summary of Estimated Costs

<u>Item</u>	<u>Federal</u>	<u>Non-Federal</u>	<u>Total</u>	<u>Maintenance</u>
<u>Desired Improvement</u>				
Dredging	\$165,000	-	\$165,000	\$5,000
Bulkheads (non-liquidating cost)	-	\$250,000	250,000	5,000
Totals	\$165,000	\$250,000	\$415,000	\$10,000
<u>Alternate Improvement</u>				
Dredging	35,000	35,000	70,000	4,000

Estimated Annual Carrying Charges

	<u>Federal</u>		<u>Non-Federal</u>		
<u>Item</u>	<u>Interest and Amortization</u>	<u>Mainte- nance</u>	<u>Interest and Amortization</u>	<u>Mainte- nance</u>	<u>Total</u>
	<u>Desired Improvement</u>				
Dredging	\$9,500	\$5,000	-	-	\$14,500
Bulkheads	<u>-</u>	<u>-</u>	<u>\$15,200</u>	<u>5,000</u>	<u>20,200</u>
Totals	9,500	5,000	15,200	5,000	34,700
	<u>Alternate Improvement</u>				
Dredging	2,000	4,000	2,100	-	8,100

WATER POWER AND OTHER SPECIAL SUBJECTS

25. Questions of water power or flood control are not pertinent to this report. Prospective use of the harbor as a seaplane base would not be adversely affected by the proposed work, nor will the improvements considered have an adverse effect on wildlife or on shellfish propagation. Repair of the entrance jetties when completed by local interests will provide some relief from shoaling in the entrance channel, but will have no appreciable effect on the erosion or accretion of the adjacent shores. Some minor land reclamation and improvement of bathing beaches would be accomplished by the deposition of dredged material on the marshland at the head of the harbor, along the beach east of the entrance and back of new bulkheads. Such deposition would make the land more usable and result in an increase in property values.

DISCUSSION

26. Vineyard and Nantucket Sounds annually attract a large number of pleasure boats. Falmouth Harbor is favorably situated in respect to these areas. Together with Hyannis and Woods Hole Harbors it is used as a base by boat owners residing at many points in New England and nearby states. As a summer resort Falmouth is dependent upon its attraction to summer visitors. Over half of Falmouth's livelihood is derived from summer residents and visitors. Many of these residents and visitors own and operate boats.

27. A fleet of about 65 pleasure craft, valued at about \$150,000 is permanently based in Falmouth Inner Harbor. The largest and most important service and repair yards on Cape Cod are situated in the harbor. Their facilities are used by pleasure and fishing craft from many ports. Mooring space in the harbor is limited both in area and in depth of water. These limitations prevent full development of the area.

28. Local interests desire the improvement of Falmouth Inner Harbor in order that the full potentialities of the area for recreational boating may be reached. They state that many craft are prevented from using the harbor by lack of adequate depths, and other craft are discouraged from using the harbor by the congestion existing therein. They propose that the harbor area be increased by dredging and bulkhead construction. They believe that this improvement will increase use of the waterway and provide an expansion in business of \$500,000 annually. Net benefits from this expansion might total \$50,000 annually.

29. The Commonwealth of Massachusetts and the Town of Falmouth have expended about \$178,000 in improving and maintaining the harbor. These improvements have attracted a great many out-of-state boat owners to the locality and have contributed to the development of the town as a summer resort. Further improvement of the harbor undoubtedly would benefit the locality, as well as provide benefits to transient boat owners. The full extent of the improvement desired by local interests is not believed necessary or desirable at this time. No extension of the State

jetties is considered necessary at this time until the capacity of the west jetty as an impounding area has been reached. The Commonwealth is prepared to repair the jetties without cost to the Federal Government. Maintenance and extension thereafter logically should be accomplished under the Federal project. The bulkheads desired by local interests are estimated to cost at least \$300,000. It is doubtful if local interests are prepared to undertake such a project at present. The alternate improvement, which contemplates the construction of about 900 linear feet of bulkhead along the town park on the east side of the harbor, would provide almost the same benefits as the more ambitious program proposed by local interests, as the major portion of the bulkhead proposed for the desired plan fronts on private property and thus probably would not be available for general use. The bulkhead considered under the alternate plan would provide mooring space for at least 50 craft moored bow and stern and thus increase the present capacity of the harbor. Extension of the 10-foot area northward as provided under the alternate plan would provide anchorage space for at least 30 additional craft as well as providing access to the Frost Boat Company for deeper draft vessels. Further extension of the bulkhead and anchorage should be deferred until the need thereof is demonstrated.

30. The monetary benefits, both general and local, to be derived from the increase in anchorage facilities and development of shore installations in Falmouth Inner Harbor are not susceptible to accurate evaluation. In view of the extensive boatyard business and the value of the harbor as a refuge for local craft, local benefits are considered predominant. Existing business at the three boatyards in Falmouth Inner Harbor, as stated in a previous paragraph, totals about \$400,000 annually. Retail business is about \$4,700,000 annually. An increase of only 25 percent in the boat-repair business and 1 percent in retail trade would provide local benefits in excess of the annual charges for all facilities considered under the alternate plan. Such increases are practically assured. The net benefits from such increases would amount to at least

\$15,000 annually. In addition, a substantial increase in tax revenue is probable. The alternate plan of improvement with annual charges of about \$8,000 is therefore amply justified; the ratio of benefits to costs being 1.9 to 1 at least.

31. General benefits from the improvement will accrue through increased use of the harbor for refuge and stimulation of the entire boating industry. These general benefits warrant Federal participation. Since local benefits are in excess of general benefits a substantial contribution should be required. In view of the large expenditures already made by local interests for development and maintenance of the waterway, a local cash contribution of about 50 percent of the total cost of dredging under the alternate plan is considered equitable. This would require a cash contribution of \$35,000. In addition, landing and mooring facilities are needed. Suitable bulkheads for use as landing facilities are estimated to cost about \$45,000, all of which would be self-liquidating and cannot be accepted as meeting the cooperation specified above. The foregoing local cooperation is reasonably assured. The Town had available \$17,000 for harbor improvements, some of which was expended for recent maintenance dredging. Additional appropriations are probable as the Board of Selectmen favor the improvement. The Commonwealth of Massachusetts, in accordance with its established policy, will probably assist the town on an equal basis in meeting any requirements of cash cooperation. The State Planning Board has agreed to recommend that the Legislature appropriate funds for State participation. These assurances of local cooperation are considered satisfactory.

32. In addition to the foregoing measures of local cooperation, local interests should place the existing jetties in good condition prior to acceptance as part of a Federal project, provide suitable spoil-disposal areas for new work and subsequent maintenance, and release the United States from claims for damages resulting from the improvements. These minor conditions of local cooperation are satisfactory to local interests and will be met. Suitable spoil-disposal areas are available.

CONCLUSIONS

33. Present and prospective use of Falmouth Inner Harbor by fishing and pleasure craft warrants extension of work done by local interests. The alternate plan of improvement is considered adequate for existing and reasonably prospective needs. Further expansion when needed can be accomplished by the construction of additional bulkheads and dredging. Local interests are satisfied that the alternate plan will meet their requirements for some time.

34. The proposed improvement will provide protected refuge facilities for pleasure craft and permit use of Falmouth's boat-repair facilities by larger fishing vessels. It will be accompanied by general as well as local benefits. General benefits are sufficient to warrant Federal participation although local benefits predominate. In view of previous local expenditures, local cash cooperation to the extent of 50 percent of the cost of dredging a suitable project is considered equitable, providing local interests also make necessary repairs to the jetties, construct a substantial bulkhead on wharf for landing and tying-up purposes, and furnish spoil-disposal areas. Local cooperation to this extent is practically assured.

RECOMMENDATION

35. It is recommended that a project be authorized for Falmouth Harbor, Massachusetts to the extent of providing an entrance channel 10 feet deep at mean low water and 100 feet wide between the jetties into the Inner Harbor and dredging of an area about 17 acres in the Inner Harbor to the same depth, all generally as shown on the accompanying map, at an estimated initial cost of \$70,000, with \$4,000 annually for maintenance including that for existing jetties, provided local interests:

a. Contribute in cash 50 percent of the initial cost, but not to exceed \$35,000;

b. Place the existing entrance jetties in a condition of repair satisfactory to the Chief of Engineers;

c. Construct concurrently at their own expense for local and

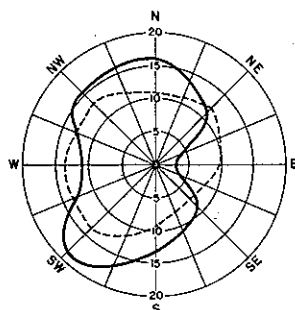
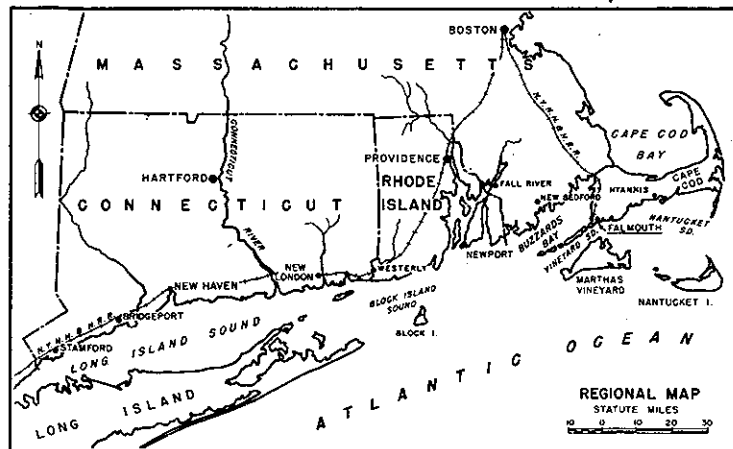
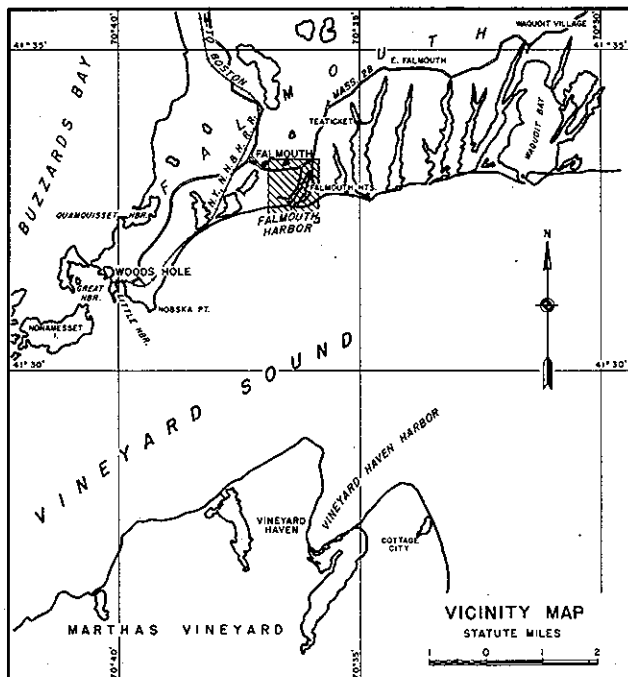
transient craft a public marginal bulkhead or wharf of a design satisfactory to the Chief of Engineers and open to all on equal terms;

d. Provide free of cost to the United States, all lands, easements, rights of way, and suitable spoil-disposal areas for the initial work and for subsequent maintenance as and when required, and

e. Hold and save the United States free from claims for damages resulting from the improvement.

36. If the project is authorized, funds in the amount of \$35,000 for the Federal portion of the initial cost should be allotted in one sum to secure economical prosecution of the work.

T. F. KERN
Colonel, Corps of Engineers
District Engineer



LEGEND
----- AVERAGE VELOCITY IN M.P.H.
===== DURATION IN PERCENT OF TIME

NOTES:

Soundings are in feet and are referred to the plane of Mean Low Water.

6-foot contour shown thus: -----

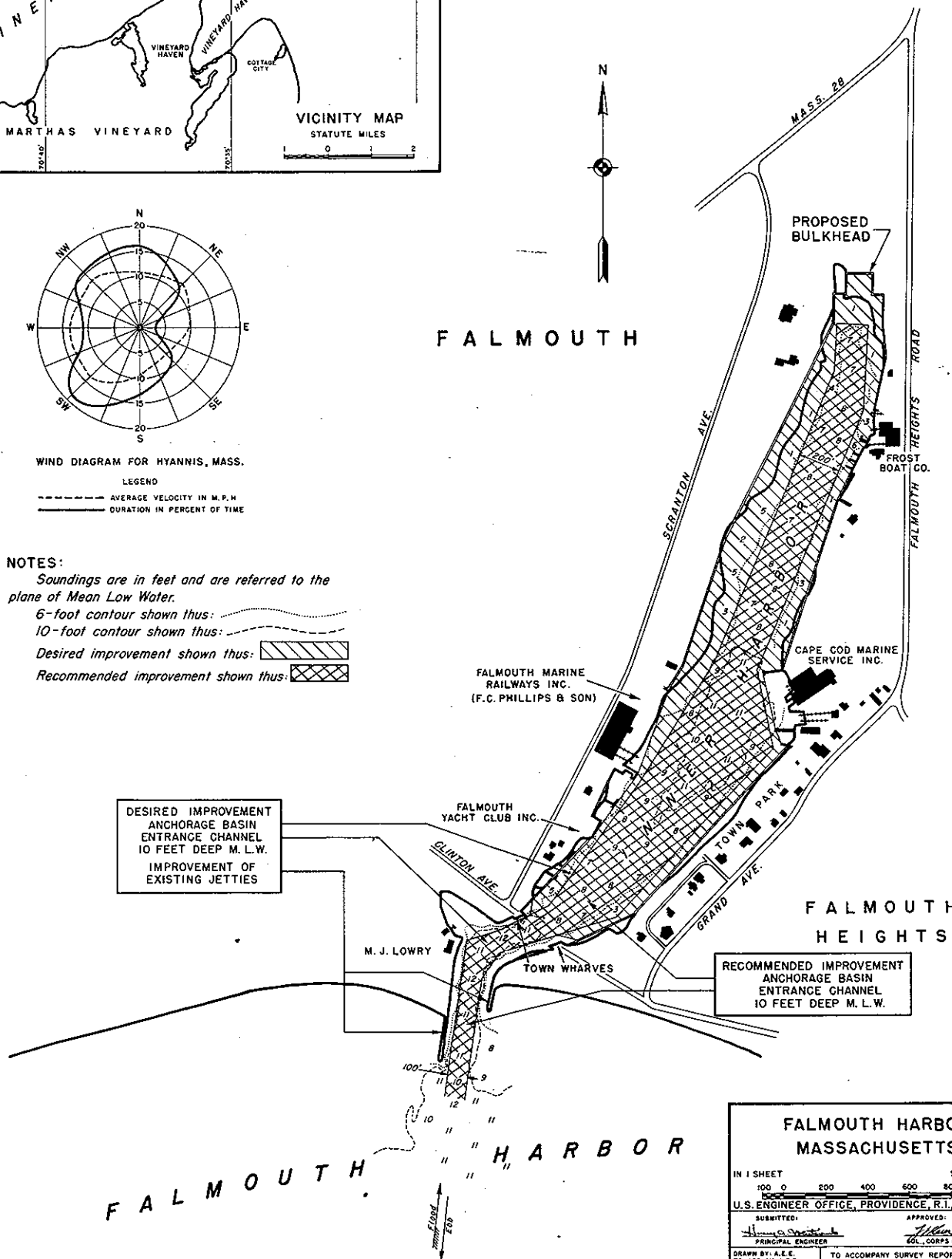
10-foot contour shown thus: -----

Desired improvement shown thus: [Hatched Box]

Recommended improvement shown thus: [Cross-hatched Box]

DESIRED IMPROVEMENT
ANCHORAGE BASIN
ENTRANCE CHANNEL
10 FEET DEEP M.L.W.
IMPROVEMENT OF
EXISTING JETTIES

RECOMMENDED IMPROVEMENT
ANCHORAGE BASIN
ENTRANCE CHANNEL
10 FEET DEEP M.L.W.



FALMOUTH HARBOR
MASSACHUSETTS

IN 1 SHEET
100 0 200 400 600 800 1000 FT.
SCALE IN FEET
U.S. ENGINEER OFFICE, PROVIDENCE, R.I., JULY 10, 1946
SUBMITTED: [Signature]
APPROVED: [Signature]
PRINCIPAL ENGINEER
DRAWN BY: A.E.E.
TRACED BY: A.E.E.
CHECKED BY: [Signature]
TO ACCOMPANY SURVEY REPORT
DATED: JULY 26, 1946
FILE NO.
FH. 4